

**REMARKS OF  
COMMISSIONER JESSICA ROSENWORCEL  
THE FUTURE OF UNLICENSED SPECTRUM  
COMPUTER HISTORY MUSEUM  
MOUNTAIN VIEW, CALIFORNIA  
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Good evening. Thank you for that kind introduction.

Let me start by thanking Engine Advocacy for helping to put this event together. This is not my first gathering with Engine Advocacy. We got to know each other shortly after I joined the Federal Communications Commission. I sat down with you in your loft-like offices in San Francisco. The communal desks were humming. The energy was palatable. The snacks were free. I was definitely not in Washington. When I was with you, you told me that policies developed in the capital can seem insular, esoteric, and far-removed from start-up life. But you also told me that innovation needs a voice in Washington, because those same policies have tremendous impact on businesses right here in California—and across the country. Our conversation stayed with me, because I try to incorporate that insight into every decision I make.

Let me also thank the Computer History Museum for hosting this event tonight. When I think of computer history, I want to rattle off my own computer history. Because I can probably recite every device I ever had and every keyboard I ever pecked at—starting with the bulky TRS-80 that I first learned to program in school. But the archives at this museum go back a lot further than the TRS-80—they go back 2000 years.

So in honor of our host, I want to dust off a story from the FCC’s archives. I won’t go back 2000 years, though—only about 30.

Three decades ago, just like today, one of the most important tasks assigned to the FCC was managing the airwaves—what we call spectrum. We had licenses for radio, television, satellite services—and a host of other things.

Despite all of this use, we also had a handful of underused frequencies, including portions of the 900 MHz, 2.4 GHz, and 5.8 GHz bands. These were airwaves that had been designated for industrial, scientific, and medical uses. But the services we imagined would develop in these bands never did, because under FCC rules they had to contend with interference from some widely used devices, like microwave ovens.

In fact, so little was happening in this spectrum, these airwaves were known in Washington as “garbage bands.” The conventional wisdom was they were junk. They were scraps of spectrum where demand for wireless licenses would just be limited.

But this is where the FCC took an interesting turn. We decided to think differently. We decided we wanted to do more than dismiss these bands as junk. So instead of following the traditional route and continuing to provide licenses to allow single operators to control in these

bands for specific purposes, we decided to ask technical experts—like so many of you in this room—for some creative ideas.

Once we got started, the questions multiplied—fast. Why should the FCC dictate what technologies should use these frequencies? What if we set some basic technical parameters instead? And what if we gave the public access to these airwaves? That would mean that instead of thinking of spectrum like a license or a lease we would think about it like a highway, where if you simply comply with the rules of the road you can do things and go places.

Let me admit in FCC circles this was edgy stuff. It was a move away from command and control spectrum policy. It was a different way to think about interference and optimizing the airwaves.

To their credit, my predecessors at the FCC not only asked the right questions—they listened and they took action. As a result, three decades ago the FCC designated its first significant swaths of unlicensed spectrum in these so-called “garbage bands.” A lot happened in the interim, including the development of a standard—802.11. But fast forward and you can clearly see how this is the spectrum where Wi-Fi was born. And in a nod to history and this museum, we can say Wi-Fi might be the most exciting and important use of unlicensed spectrum in, say, 2000 years.

So you see, Washington gets things right sometimes.

Still, that story took place roughly three decades ago. That was when Steve Jobs was still trying to figure out what to do after Apple decided it no longer wanted him at the helm. A lot has changed since then. So let’s turn from the past to the present—and discuss unlicensed spectrum here and now.

Today, in countless ways, our lives have grown dependent on wireless connectivity. In fact, they are getting more dependent every day. Last year alone we connected more than 500 million new devices to the Internet. So it is no wonder that the demand for our airwaves continues to grow at a breathtaking pace. But so much of the conversation about spectrum continues to be about the demand for licensed spectrum. In fact, the growing demand for licensed spectrum—airwaves that can be controlled by a single wireless operator—has received a lot of legislative attention. As a result, the FCC will hold a series of auctions for licensed spectrum this year and next.

That is good as far as it goes. But we have to remember that the demand for unlicensed spectrum is also growing. So the spectrum that powers Wi-Fi and a slew of our daily activities and devices is also getting more congested.

Why should you care?

First, the unlicensed economy represents economic growth. In fact, the economic impact of unlicensed spectrum has been estimated at \$140 billion annually. By any measure, that is a really, really big number.

Second, the unlicensed economy represents Internet connectivity. Wi-Fi is an essential onramp to the Internet. But more than that, nearly one-half of wireless data connections are now offloaded onto unlicensed spectrum. This helps manage the flow of traffic on our licensed airwaves.

Third, the unlicensed economy represents innovation. The power of unlicensed is the power to innovate. That's because the low barriers to entry for unlicensed airwaves make them perfect sandboxes for experimentation. Keeping airwaves open and available for unlicensed exploration allows you to tinker. It allows you to try out big ideas at small risk. And that means when you go looking for funding, you do not need to explain how you will get access to expensive wireless licenses. That's big.

So thirty years after the FCC first cleared airwaves for unlicensed use, I think we can safely call our approach a success. Because unlicensed spectrum is now an essential part of the wireless ecosystem, a critical component for innovation, and an important input into the modern economy.

But rather than coasting on what came before, it is the time for action. We need a game plan for unlicensed spectrum. Unlicensed spectrum can no longer be an afterthought, cobbled together after the fact from junk bands. It deserves attention upfront and in policy primetime.

So let me sketch out what an unlicensed game plan looks like. It takes high-band, mid-band, and low-band spectrum. High-band spectrum provides the large channels necessary for high-definition video at short distances—think streaming video from your laptop to your television. Mid-band spectrum sacrifices some of that throughput, but gives you further reach. Low-band spectrum can go far and wide, and as a result is ideal for larger-scale Wi-Fi deployments and machine-to-machine communications.

To build powerful wireless communications systems, you need a playbook that includes all three.

Now forgive me for a moment I delve deep in wireless geek. Given the setting, I thought that would be okay. With respect to high-band spectrum, I am proud to report that the FCC has made terrific progress—specifically in the 5 GHz band. This band is widely used for home Wi-Fi systems. It may be in many of your homes right now. A few months ago, after a year of prodding from myself and others, the FCC voted to expand to the 5.150-5.250 GHz band the flexible rules that have already made the 5.725-5.825 GHz band an unlicensed success story. Now that may sound technical. But it is going to have real impact. So let me put that impact in plain English: it has effectively doubled unlicensed bandwidth in the 5 GHz band overnight. That means twice as much Wi-Fi opportunity in the 5 GHz band. That is really good news.

Next up, mid-band spectrum. This is the spectrum we made unlicensed three decades ago. This is the birthplace of Wi-Fi. But the 2.4 GHz band where unlicensed makes its mid-band home has become mighty crowded. It's a band where the Wi-Fi every one of us uses is packed in along with Bluetooth, wireless speakers, and video game consoles. So we need to be

on the watch for new mid-band opportunities for unlicensed spectrum, especially in airwaves that are underutilized.

Finally, we have low-band spectrum. This is where opportunities—and challenges—involving unlicensed spectrum are coming up really soon.

Earlier this year the FCC developed policies for mobile broadband use in the 600 MHz band. As low-band spectrum goes, the 600 MHz band is as good as it gets. These airwaves can sound almost heroic—they can leap over tall buildings and go through walls like they are not even there. They are pretty super, so it's no wonder they draw so much attention.

The opportunity to make more use of the 600 MHz band for mobile broadband comes to us straight from Congress, courtesy of a law known as the Middle Class Tax Relief and Job Creation Act. Under this law, the FCC will conduct the first-of-its-kind voluntary incentive auctions to repurpose 600 MHz broadcast airwaves for wireless broadband service. This is a huge and complicated exercise. But it also comes with real opportunity for growing unlicensed services. Because as part of this law, Congress granted the FCC the authority to use technically reasonable guard bands to expand unlicensed opportunities in the 600 MHz band.

So just a few months ago, I worked with my colleagues back at the FCC to find a creative framework that gives both new and old uses access to these airwaves. We started by ditching the tired notion that we face a choice between licensed and unlicensed spectrum. That is a simplistic relic from the past that we should have long since retired—because good spectrum policy requires both. So we were able to find a smart balance under the law between licensed and unlicensed services with a goal of enough unlicensed channels for Wi-Fi in every market in the 600 MHz band.

This could be the start of a terrific expansion of unlicensed spectrum and services. But we could use your input. Because later this month the FCC will be proposing the technical rules for our framework for unlicensed spectrum in the 600 MHz band. And you know that old saying about the devil dwelling in details? Here's my corollary: There are no small details with big impact like those involving spectrum policy. So take a look at what we develop and then help us—just like innovators did thirty years ago—make sure our unlicensed spectrum policies are smart, creative, and forward-thinking.

So there it is. Three decades after unlicensed spectrum got its start in airwaves known as junk, it has become a powerful force in the economy. How cool is that? But more unlicensed spectrum means more than just more Wi-Fi. It means more innovation without license. It means a real jolt to the Internet of Things and the innovative possibilities of machine-to-machine communications. So now that we have a game plan, I hope you will work with me and make it happen.

Thank you.